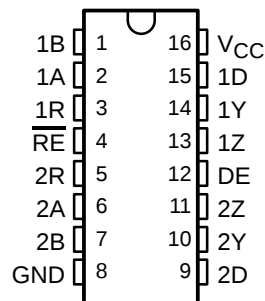


# SN75ALS1177, SN75ALS1178 DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

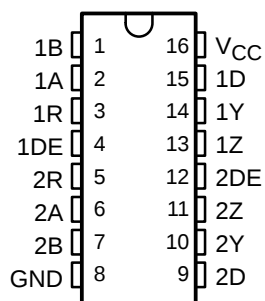
SLLS154B – MARCH 1993 – REVISED FEBRUARY 2001

- Meet or Exceed Standards TIA/EIA-422-B and TIA/EIA-485-A
- Designed for Multipoint Bus Transmission on Long Bus Lines in Noisy Environments
- Low Supply-Current Requirement  
50 mA Max
- Driver Positive- and Negative-Current Limiting
- Driver Common-Mode Output Voltage Range of  $-7\text{ V}$  to  $12\text{ V}$
- Thermal Shutdown Protection
- Driver 3-State Outputs Active-High Enable
- Receiver Common-Mode Input Voltage Range of  $-12\text{ V}$  to  $12\text{ V}$
- Receiver Input Sensitivity . . .  $\pm 200\text{ mV}$
- Receiver Hysteresis . . .  $50\text{ mV}$  Typ
- Receiver High Input Impedance . . .  $12\text{ k}\Omega$  Min
- Receiver 3-State Outputs Active-Low Enable for SN75ALS1177 Only
- Operate From Single 5-V Supply

SN75ALS1177 . . . N OR NS PACKAGE  
(TOP VIEW)



SN75ALS1178 . . . N OR NS PACKAGE  
(TOP VIEW)



## description

The SN75ALS1177 and SN75ALS1178 dual differential drivers and receivers are integrated circuits designed for bidirectional data communication on multipoint bus transmission lines. They are designed for balanced transmission lines and meet standards TIA/EIA-422-B and TIA/EIA-485-A.

The SN75ALS1177 combines dual 3-state differential line drivers and dual 3-state differential input line receivers, both of which operate from a single 5-V power supply. The drivers and receivers have active-high and active-low enables, respectively, which can be externally connected together to function as direction control. The SN75ALS1178 drivers each have an individual active-high enable. Fail-safe design ensures that when the receiver inputs are open, the receiver outputs are always high.

The SN75ALS1177 and SN75ALS1178 are characterized for operation from  $0^{\circ}\text{C}$  to  $70^{\circ}\text{C}$ .

### AVAILABLE OPTIONS

| T <sub>A</sub>                              | PACKAGED DEVICES |                            |
|---------------------------------------------|------------------|----------------------------|
|                                             | PLASTIC DIP (N)  | PLASTIC SMALL OUTLINE (NS) |
| $0^{\circ}\text{C}$ to $70^{\circ}\text{C}$ | SN75ALS1177N     | SN75ALS1177NSR             |
|                                             | SN75ALS1178N     | SN75ALS1178NSR             |

The NS package is only available taped and reeled. Add the suffix R to the device type (e.g., SN75ALS1177NSR).



Please be aware that an important notice concerning availability, standard warranty, and use in critical applications of Texas Instruments semiconductor products and disclaimers thereto appears at the end of this data sheet.

PRODUCTION DATA information is current as of publication date. Products conform to specifications per the terms of Texas Instruments standard warranty. Production processing does not necessarily include testing of all parameters.

 **TEXAS  
INSTRUMENTS**

POST OFFICE BOX 655303 • DALLAS, TEXAS 75265

Copyright © 2001, Texas Instruments Incorporated

# SN75ALS1177, SN75ALS1178

## DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

SLLS154B – MARCH 1993 – REVISED FEBRUARY 2001

### Function Tables

SN75ALS1177, SN75ALS1178  
(each driver)

| INPUT<br>D | ENABLE<br>DE | OUTPUTS |   |
|------------|--------------|---------|---|
|            |              | Y       | Z |
| H          | H            | H       | L |
| L          | H            | L       | H |
| X          | L            | Z       | Z |

SN75ALS1177  
(each receiver)

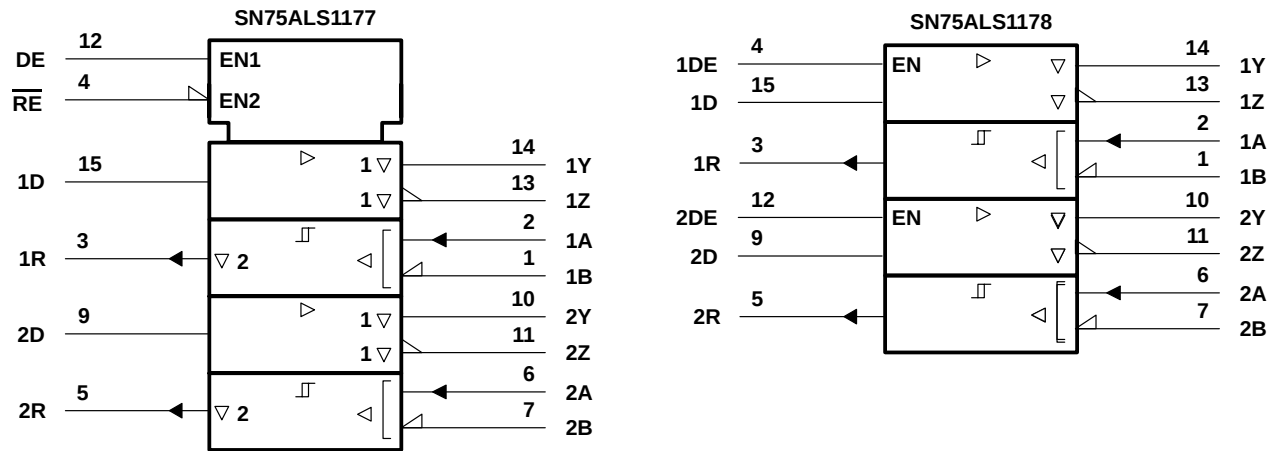
| DIFFERENTIAL<br>A-B                              | ENABLE<br>$\overline{\text{RE}}$ | OUTPUT<br>Y |
|--------------------------------------------------|----------------------------------|-------------|
| $V_{\text{ID}} \geq 0.2 \text{ V}$               | L                                | H           |
| $-0.2 \text{ V} < V_{\text{ID}} < 0.2 \text{ V}$ | L                                | ?           |
| $V_{\text{ID}} \leq -0.2 \text{ V}$              | L                                | L           |
| X                                                | H                                | Z           |
| Open                                             | L                                | H           |

SN75ALS1178  
(each receiver)

| DIFFERENTIAL<br>A-B                              | OUTPUT<br>Y |
|--------------------------------------------------|-------------|
| $V_{\text{ID}} \geq 0.2 \text{ V}$               | H           |
| $-0.2 \text{ V} < V_{\text{ID}} < 0.2 \text{ V}$ | ?           |
| $V_{\text{ID}} \leq -0.2 \text{ V}$              | L           |
| Open                                             | H           |

H = High level, L = Low level,  
? = Indeterminate, X = Irrelevant,  
Z = High impedance (off)

### logic symbol†

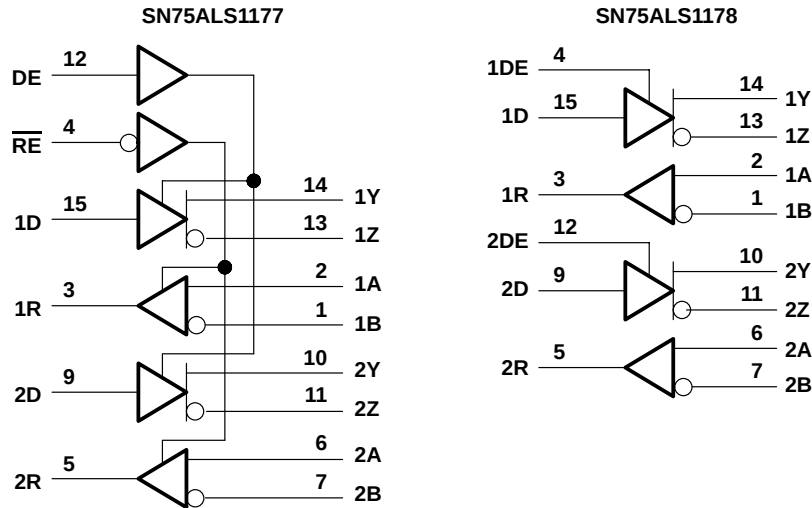


† These symbols are in accordance with ANSI/IEEE Std 91-1984 and IEC Publication 617-12.

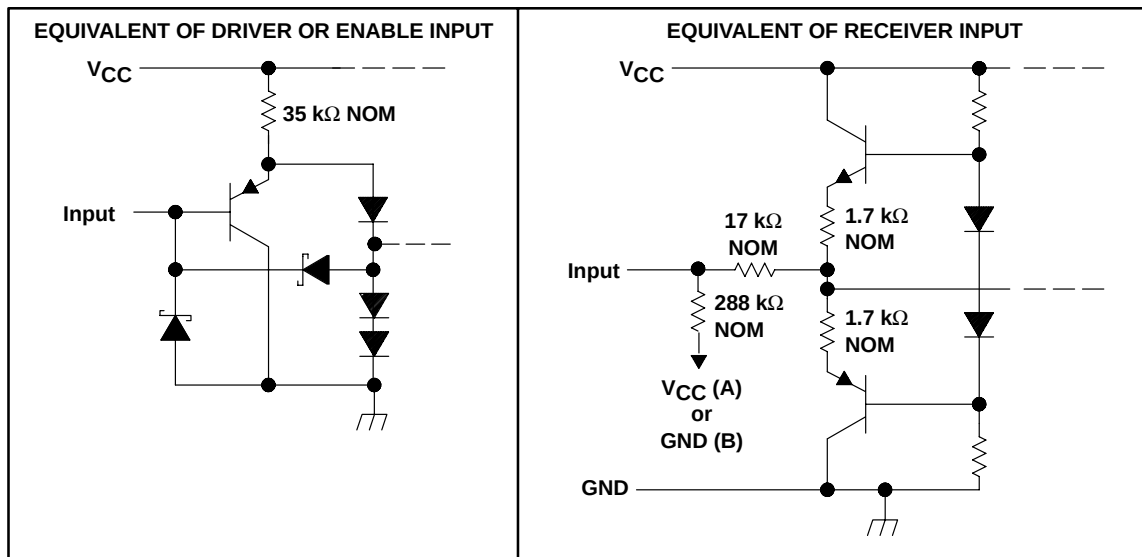
# SN75ALS1177, SN75ALS1178 DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

SLLS154B – MARCH 1993 – REVISED FEBRUARY 2001

## logic diagram (positive logic)



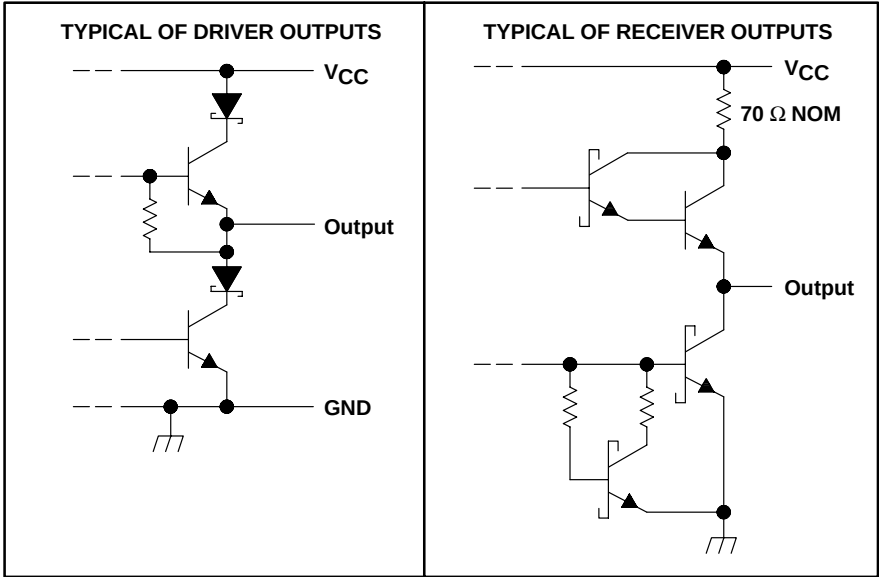
## equivalent schematics



SN75ALS1177, SN75ALS1178  
DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

SLLS154B – MARCH 1993 – REVISED FEBRUARY 2001

schematics of outputs



absolute maximum ratings over operating free-air temperature range (unless otherwise noted)<sup>†</sup>

|                                                                  |                |
|------------------------------------------------------------------|----------------|
| Supply voltage, $V_{CC}$ (see Note 1)                            | 7 V            |
| Input voltage, $V_I$ (DE, $\overline{RE}$ , and D inputs)        | 7 V            |
| Output voltage range, $V_O$ (driver)                             | –9 V to 14 V   |
| Input voltage range, receiver                                    | –14 V to 14 V  |
| Receiver differential-input voltage range (see Note 2)           | –14 V to 14 V  |
| Receiver low-level output current                                | 50 mA          |
| Package thermal impedance, $\theta_{JA}$ (see Note 3): N package | 67°C/W         |
| NS package                                                       | 64°C/W         |
| Lead temperature 1,6 mm (1/16 inch) from case for 10 seconds     | 260°C          |
| Storage temperature range, $T_{stg}$                             | –65°C to 150°C |

<sup>†</sup> Stresses beyond those listed under “absolute maximum ratings” may cause permanent damage to the device. These are stress ratings only, and functional operation of the device at these or any other conditions beyond those indicated under “recommended operating conditions” is not implied. Exposure to absolute-maximum-rated conditions for extended periods may affect device reliability.

- NOTES: 1. All voltage values, except differential input voltage, are with respect to the network ground terminal.  
2. Differential input voltage is measured at the noninverting terminal with respect to the inverting terminal.  
3. The package thermal impedance is calculated in accordance with JESD 51-7.

# SN75ALS1177, SN75ALS1178 DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

SLLS154B – MARCH 1993 – REVISED FEBRUARY 2001

## recommended operating conditions

|                 |                                | MIN                     | NOM | MAX             | UNIT |
|-----------------|--------------------------------|-------------------------|-----|-----------------|------|
| V <sub>CC</sub> | Supply voltage                 | 4.75                    | 5   | 5.25            | V    |
| V <sub>ID</sub> | Differential input voltage     | Receiver                |     | ±12             | V    |
| V <sub>OC</sub> | Common-mode output voltage     | Driver                  |     | –7 <sup>†</sup> | V    |
| V <sub>IC</sub> | Common-mode input voltage      | Receiver                |     | ±12             | V    |
| V <sub>IH</sub> | High-level input voltage       | DE, $\overline{RE}$ , D |     | 2               | V    |
| V <sub>IL</sub> | Low-level input voltage        | DE, $\overline{RE}$ , D |     | 0.8             | V    |
| I <sub>OH</sub> | High-level output current      | Driver                  |     | –60             | mA   |
|                 |                                | Receiver                |     | –400            | μA   |
| I <sub>OL</sub> | Low-level output current       | Driver                  |     | 60              | mA   |
|                 |                                | Receiver                |     | 8               |      |
| T <sub>A</sub>  | Operating free-air temperature | 0                       |     | 70              | °C   |

<sup>†</sup> The algebraic convention, where the less positive (more negative) limit is designated as minimum, is used in this data sheet for common-mode output and threshold voltage level only.



# SN75ALS1177, SN75ALS1178

## DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

SLLS154B – MARCH 1993 – REVISED FEBRUARY 2001

### DRIVER SECTION

**electrical characteristics over recommended ranges of supply voltage and operating free-air temperature (unless otherwise noted)**

| PARAMETER                                                                           | TEST CONDITIONS                                                          | MIN                                    | TYP <sup>†</sup> | MAX  | UNIT |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------|----------------------------------------|------------------|------|------|
| V <sub>IK</sub> Input clamp voltage                                                 | I <sub>I</sub> = -18 mA                                                  |                                        |                  | -1.5 | V    |
| V <sub>OH</sub> High-level output voltage                                           | V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V, I <sub>OH</sub> = -33 mA |                                        | 3.3              |      | V    |
| V <sub>OL</sub> Low-level output voltage                                            | V <sub>IH</sub> = 2 V, V <sub>IL</sub> = 0.8 V, I <sub>OL</sub> = 33 mA  |                                        | 1.1              |      | V    |
| V <sub>OD1</sub>   Differential output voltage                                      | I <sub>O</sub> = 0                                                       | 1.5                                    |                  | 6    | V    |
| V <sub>OD2</sub>   Differential output voltage                                      | V <sub>CC</sub> = 5 V, R <sub>L</sub> = 100 Ω, See Figure 1              | 1/2 V <sub>OD1</sub> or 2 <sup>‡</sup> |                  |      | V    |
|                                                                                     | R <sub>L</sub> = 54 Ω, See Figure 1                                      | 1.5                                    | 2.5              | 5    |      |
| V <sub>OD3</sub>   Differential output voltage                                      | See Note 4                                                               | 1.5                                    |                  | 5    | V    |
| Δ V <sub>OD</sub>   Change in magnitude of differential output voltage (see Note 5) | R <sub>L</sub> = 54 Ω or 100 Ω, See Figure 1                             |                                        |                  | ±0.2 | V    |
| V <sub>OC</sub> Common-mode output voltage                                          | R <sub>L</sub> = 54 Ω or 100 Ω, See Figure 1                             | -1 <sup>§</sup>                        |                  | 3    | V    |
| Δ V <sub>OC</sub>   Change in magnitude of common-mode output voltage (see Note 5)  | R <sub>L</sub> = 54 Ω or 100 Ω, See Figure 1                             |                                        |                  | ±0.2 | V    |
| I <sub>O(OFF)</sub> Output current with power off                                   | V <sub>CC</sub> = 0, V <sub>O</sub> = -7 V to 12 V                       |                                        |                  | ±100 | μA   |
| I <sub>OZ</sub> High-impedance-state output current                                 | V <sub>O</sub> = -7 V to 12 V                                            |                                        |                  | ±100 | μA   |
| I <sub>IH</sub> High-level input current                                            | V <sub>IH</sub> = 2.7 V                                                  |                                        |                  | 100  | μA   |
| I <sub>IL</sub> Low-level input current                                             | V <sub>IL</sub> = 0.4 V                                                  |                                        |                  | -100 | μA   |
| I <sub>OS</sub> Short-circuit output current                                        | V <sub>O</sub> = -7 V                                                    |                                        |                  | -250 | mA   |
|                                                                                     | V <sub>O</sub> = V <sub>CC</sub>                                         |                                        |                  | 250  |      |
|                                                                                     | V <sub>O</sub> = 12 V                                                    |                                        |                  | 250  |      |
|                                                                                     | V <sub>O</sub> = 0 V                                                     |                                        |                  | 150  |      |
| I <sub>CC</sub> Supply current (total package)                                      | No load                                                                  |                                        |                  |      | mA   |
|                                                                                     | Outputs enabled                                                          |                                        | 35               | 50   |      |
|                                                                                     | Outputs disabled                                                         |                                        | 20               | 50   |      |

<sup>†</sup> All typical values are at V<sub>CC</sub> = 5 V and T<sub>A</sub> = 25°C.

<sup>‡</sup> The minimum V<sub>OD2</sub> with a 100-Ω load is either 1/2 V<sub>OD1</sub> or 2 V, whichever is greater.

<sup>§</sup> The algebraic convention, where the less positive (more negative) limit is designated as minimum, is used in this data sheet for common-mode output and threshold voltage levels only.

NOTES: 4. See TIA/EIA-485-A Figure 3.5, test termination measurement 2.

5. Δ|V<sub>OD</sub>| and Δ|V<sub>OC</sub>| are the changes in magnitude of V<sub>OD</sub> and V<sub>OC</sub>, respectively, that occur when the input is changed from a high level to a low level.

### switching characteristics at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (unless otherwise noted)

| PARAMETER                                                          | TEST CONDITIONS                                                                 | MIN | TYP | MAX | UNIT |
|--------------------------------------------------------------------|---------------------------------------------------------------------------------|-----|-----|-----|------|
| t <sub>PLH</sub> Propagation delay time, high- to low-level output | R <sub>L</sub> = 60 Ω, C <sub>L1</sub> = C <sub>L2</sub> = 100 pF, See Figure 3 | 9   | 15  | 22  | ns   |
| t <sub>PHL</sub> Propagation delay time, low- to high-level output | R <sub>L</sub> = 60 Ω, C <sub>L1</sub> = C <sub>L2</sub> = 100 pF, See Figure 3 | 9   | 15  | 22  | ns   |
| t <sub>sk</sub> Output-to-output skew                              | R <sub>L</sub> = 60 Ω, C <sub>L1</sub> = C <sub>L2</sub> = 100 pF, See Figure 3 | 0   | 2   | 8   | ns   |
| t <sub>PZH</sub> Output enable time to high level                  | C <sub>L</sub> = 100 pF, See Figure 4                                           | 30  | 35  | 50  | ns   |
| t <sub>PZL</sub> Output enable time to low level                   | C <sub>L</sub> = 100 pF, See Figure 5                                           | 5   | 15  | 25  | ns   |
| t <sub>PHZ</sub> Output disable time from high level               | C <sub>L</sub> = 15 pF, See Figure 4                                            | 7   | 15  | 30  | ns   |
| t <sub>PLZ</sub> Output disable time from low level                | C <sub>L</sub> = 15 pF, See Figure 5                                            | 7   | 15  | 30  | ns   |



# SN75ALS1177, SN75ALS1178 DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

SLLS154B – MARCH 1993 – REVISED FEBRUARY 2001

## RECEIVER SECTION

electrical characteristics over recommended ranges of common-mode input voltage, supply voltage, and operating free-air temperature (unless otherwise noted)

| PARAMETER        |                                                                 | TEST CONDITIONS                                                   | MIN               | TYP <sup>†</sup> | MAX  | UNIT |
|------------------|-----------------------------------------------------------------|-------------------------------------------------------------------|-------------------|------------------|------|------|
| V <sub>IT+</sub> | Positive-going input threshold voltage                          | V <sub>O</sub> = 2.7 V, I <sub>O</sub> = -0.4 mA                  |                   |                  | 0.2  | V    |
| V <sub>IT-</sub> | Negative-going input threshold voltage                          | V <sub>O</sub> = 0.5 V, I <sub>O</sub> = 8 mA                     | -0.2 <sup>‡</sup> |                  |      | V    |
| V <sub>hys</sub> | Input hysteresis voltage (V <sub>IT+</sub> - V <sub>IT-</sub> ) |                                                                   |                   | 50               |      | mV   |
| V <sub>IK</sub>  | Enable input clamp voltage                                      | SN75ALS1177 I <sub>I</sub> = -18 mA                               |                   |                  | -1.5 | V    |
| V <sub>OH</sub>  | High-level output voltage                                       | V <sub>ID</sub> = 200 mV, I <sub>OH</sub> = -400 µA, See Figure 2 | 2.7               |                  |      | V    |
| V <sub>OL</sub>  | Low-level output voltage                                        | V <sub>ID</sub> = 200 mV, I <sub>OL</sub> = 8 mA, See Figure 2    |                   |                  | 0.45 | V    |
| I <sub>OZ</sub>  | High-impedance-state output current                             | SN75ALS1177 V <sub>O</sub> = 0.4 V to 2.4 V                       |                   |                  | ±20  | µA   |
| I <sub>I</sub>   | Line input current (see Note 6)                                 | Other input at 0 V                                                |                   |                  |      |      |
|                  |                                                                 | V <sub>I</sub> = 12 V                                             |                   |                  | 1    | mA   |
|                  |                                                                 | V <sub>I</sub> = -7 V                                             |                   |                  | -0.8 | mA   |
| I <sub>IH</sub>  | High-level input current, $\overline{\text{RE}}$                | SN75ALS1177 V <sub>IH</sub> = 2.7 V                               |                   |                  | 20   | µA   |
| I <sub>IL</sub>  | Low-level input current, $\overline{\text{RE}}$                 | SN75ALS1177 V <sub>IL</sub> = 0.4 V                               |                   |                  | -100 | µA   |
| r <sub>i</sub>   | Input resistance                                                |                                                                   | 12                |                  |      | kΩ   |
| I <sub>OS</sub>  | Short-circuit output current                                    | V <sub>O</sub> = 0 V, See Note 7                                  | -15               |                  | -85  | mA   |
| I <sub>CC</sub>  | Supply current (total package)                                  | No load, Outputs enabled                                          |                   | 35               | 50   | mA   |

<sup>†</sup> All typical values are at V<sub>CC</sub> = 5 V and T<sub>A</sub> = 25°C.

<sup>‡</sup> The algebraic convention, where the less positive (more negative) limit is designated as minimum, is used in this data sheet for common-mode output and threshold voltage levels only.

NOTES: 6. Refer to TIA/EIA-422-B, TIA/EIA-423-A, and TIA/EIA-485-A for exact conditions.

7. Not more than one output should be shorted at a time.

## switching characteristics at V<sub>CC</sub> = 5 V, T<sub>A</sub> = 25°C (unless otherwise noted)

| PARAMETER        |                                                   | TEST CONDITIONS                                   | MIN | TYP | MAX | UNIT |
|------------------|---------------------------------------------------|---------------------------------------------------|-----|-----|-----|------|
| t <sub>PLH</sub> | Propagation delay time, low- to high-level output | C <sub>L</sub> = 15 pF, See Figure 6              | 15  | 25  | 37  | ns   |
| t <sub>PHL</sub> | Propagation delay time, high- to low-level output | C <sub>L</sub> = 15 pF, See Figure 6              | 15  | 25  | 37  | ns   |
| t <sub>pZH</sub> | Output enable time to high level                  | SN75ALS1177 C <sub>L</sub> = 100 pF, See Figure 7 | 10  | 20  | 30  | ns   |
| t <sub>pZL</sub> | Output enable time to low level                   | SN75ALS1177 C <sub>L</sub> = 100 pF, See Figure 7 | 10  | 20  | 30  | ns   |
| t <sub>pHZ</sub> | Output disable time from high level               | SN75ALS1177 C <sub>L</sub> = 15 pF, See Figure 7  | 3.5 | 12  | 16  | ns   |
| t <sub>pLZ</sub> | Output disable time from low level                | SN75ALS1177 C <sub>L</sub> = 15 pF, See Figure 7  | 5   | 12  | 16  | ns   |



# SN75ALS1177, SN75ALS1178 DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

SLLS154B – MARCH 1993 – REVISED FEBRUARY 2001

## PARAMETER MEASUREMENT INFORMATION

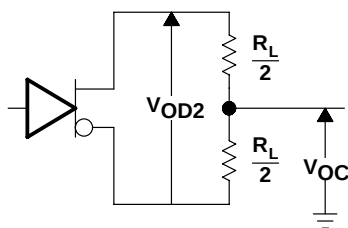


Figure 1. Driver Test Circuit,  $V_{OD}$  and  $V_{OC}$

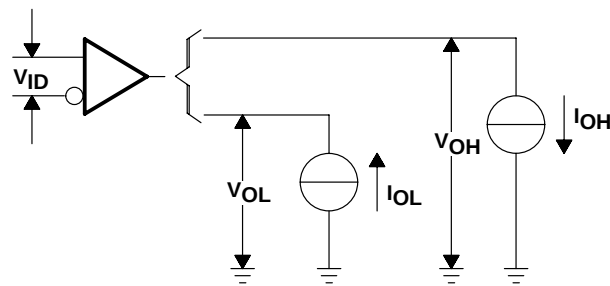
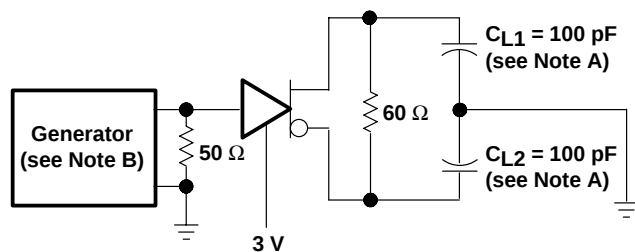
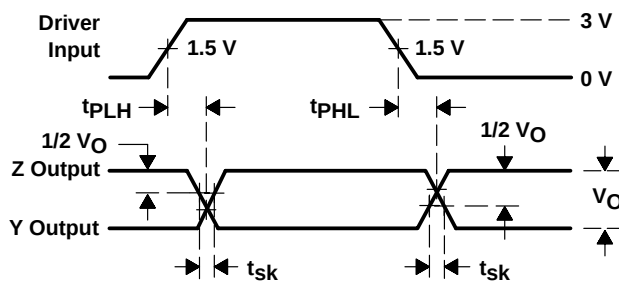


Figure 2. Receiver Test Circuit,  $V_{OH}$  and  $V_{OL}$



DRIVER TEST CIRCUIT

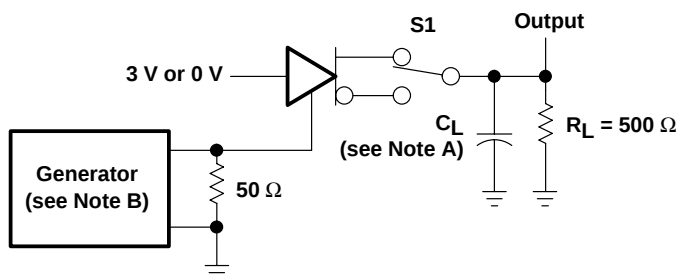


DRIVER VOLTAGE WAVEFORMS

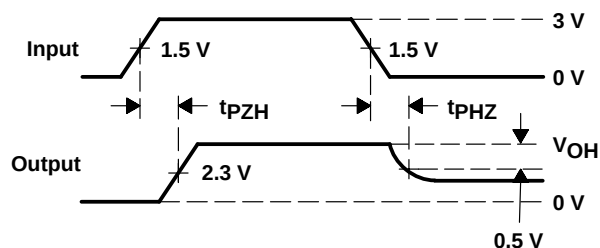
NOTES: A.  $C_L$  includes probe and jig capacitance.

B. The pulse generator has the following characteristics:  $PRR \leq 1$  MHz, 50% duty cycle,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

Figure 3. Driver Propagation Delay Times



DRIVER TEST CIRCUIT



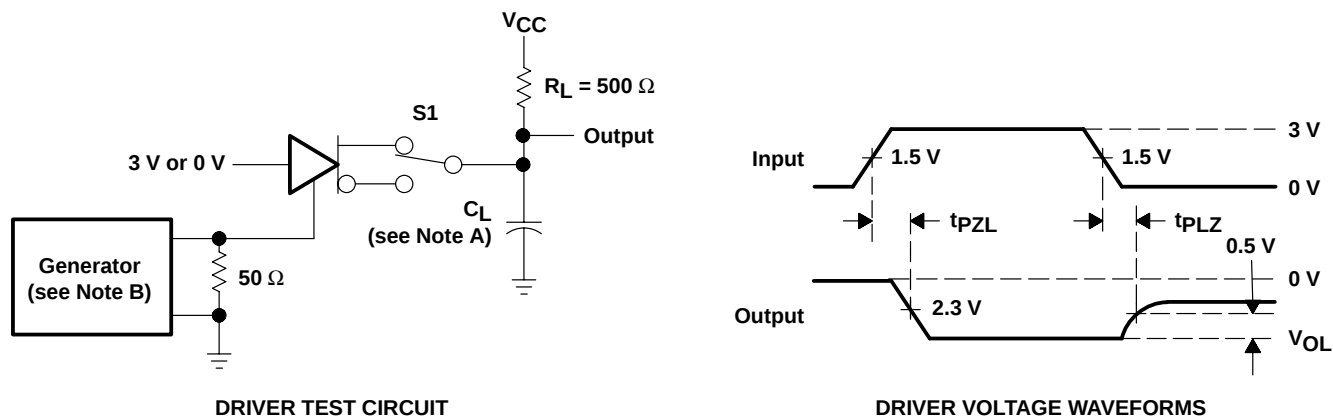
DRIVER VOLTAGE WAVEFORMS

NOTES: A.  $C_L$  includes probe and jig capacitance.

B. The pulse generator has the following characteristics:  $PRR \leq 1$  MHz, 50% duty cycle,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

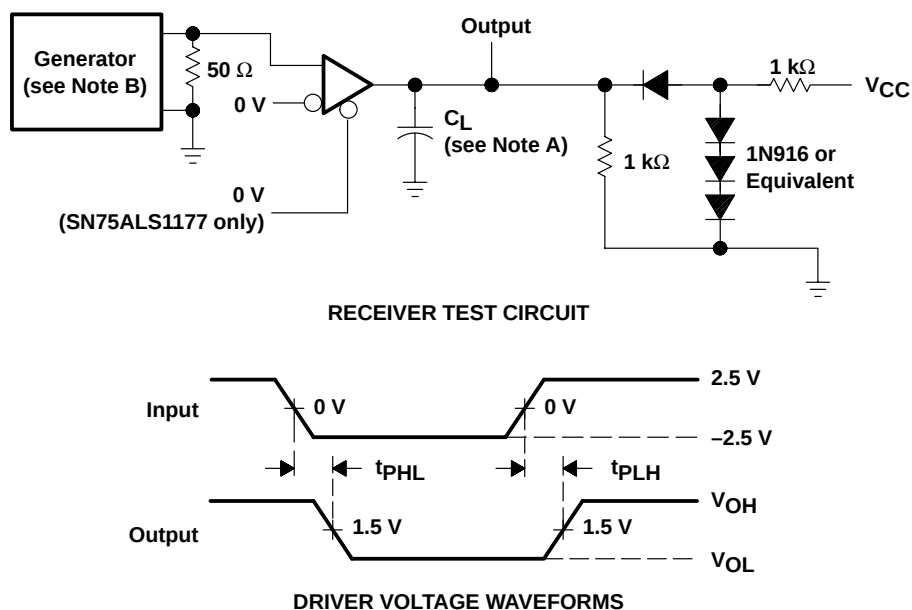
Figure 4. Driver Enable and Disable Times

## PARAMETER MEASUREMENT INFORMATION



- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. The pulse generator has the following characteristics:  $PRR \leq 1\text{ MHz}$ , 50% duty cycle,  $t_r \leq 10\text{ ns}$ ,  $t_f \leq 10\text{ ns}$ .

Figure 5. Driver Enable and Disable Times



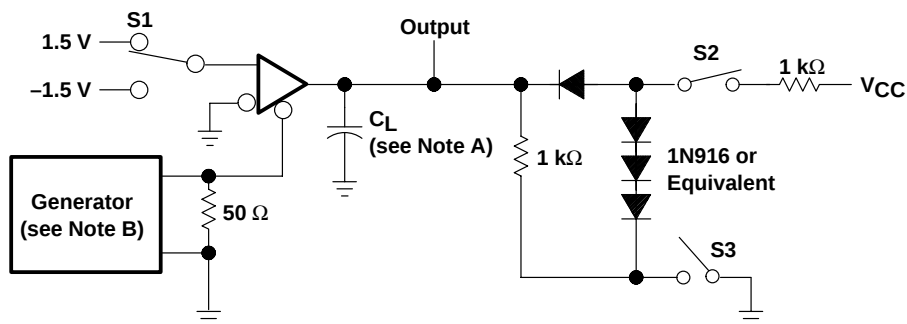
- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. The pulse generator has the following characteristics:  $PRR \leq 1\text{ MHz}$ , 50% duty cycle,  $t_r \leq 10\text{ ns}$ ,  $t_f \leq 10\text{ ns}$ .

Figure 6. Receiver Propagation Delay Times

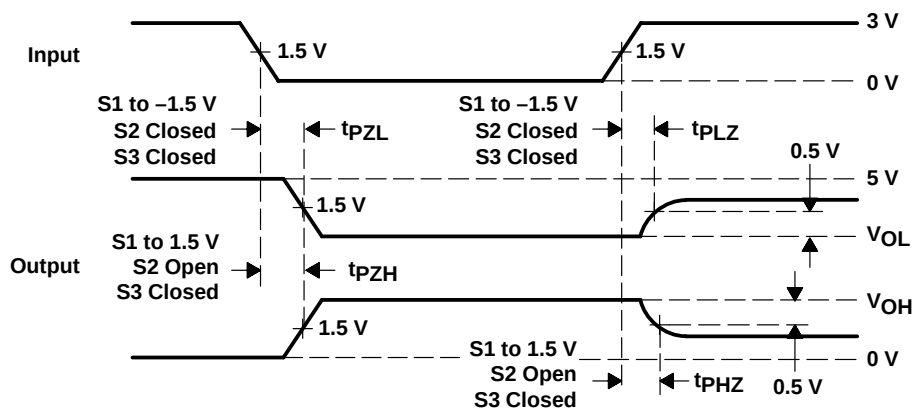
# SN75ALS1177, SN75ALS1178 DUAL DIFFERENTIAL DRIVERS AND RECEIVERS

SLLS154B – MARCH 1993 – REVISED FEBRUARY 2001

## PARAMETER MEASUREMENT INFORMATION



## RECEIVER TEST CIRCUIT



## RECEIVER VOLTAGE WAVEFORMS

- NOTES: A.  $C_L$  includes probe and jig capacitance.  
B. The pulse generator has the following characteristics:  $PRR \leq 1$  MHz, 50% duty cycle,  $t_r \leq 10$  ns,  $t_f \leq 10$  ns.

Figure 7. Receiver Output Enable and Disable Times

**PACKAGING INFORMATION**

| Orderable Device | Status <sup>(1)</sup> | Package Type | Package Drawing | Pins | Package Qty | Eco Plan <sup>(2)</sup> | Lead/Ball Finish | MSL Peak Temp <sup>(3)</sup> |
|------------------|-----------------------|--------------|-----------------|------|-------------|-------------------------|------------------|------------------------------|
| SN75ALS1177N     | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN75ALS1177NE4   | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN75ALS1177NSLE  | OBSOLETE              | SO           | NS              | 16   |             | TBD                     | Call TI          | Call TI                      |
| SN75ALS1177NSR   | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN75ALS1177NSRE4 | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN75ALS1177NSRG4 | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN75ALS1178N     | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN75ALS1178NE4   | ACTIVE                | PDIP         | N               | 16   | 25          | Pb-Free (RoHS)          | CU NIPDAU        | N / A for Pkg Type           |
| SN75ALS1178NSLE  | OBSOLETE              | SO           | NS              | 16   |             | TBD                     | Call TI          | Call TI                      |
| SN75ALS1178NSR   | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |
| SN75ALS1178NSRG4 | ACTIVE                | SO           | NS              | 16   | 2000        | Green (RoHS & no Sb/Br) | CU NIPDAU        | Level-1-260C-UNLIM           |

<sup>(1)</sup> The marketing status values are defined as follows:

**ACTIVE:** Product device recommended for new designs.

**LIFEBUY:** TI has announced that the device will be discontinued, and a lifetime-buy period is in effect.

**NRND:** Not recommended for new designs. Device is in production to support existing customers, but TI does not recommend using this part in a new design.

**PREVIEW:** Device has been announced but is not in production. Samples may or may not be available.

**OBSOLETE:** TI has discontinued the production of the device.

<sup>(2)</sup> Eco Plan - The planned eco-friendly classification: Pb-Free (RoHS), Pb-Free (RoHS Exempt), or Green (RoHS & no Sb/Br) - please check <http://www.ti.com/productcontent> for the latest availability information and additional product content details.

**TBD:** The Pb-Free/Green conversion plan has not been defined.

**Pb-Free (RoHS):** TI's terms "Lead-Free" or "Pb-Free" mean semiconductor products that are compatible with the current RoHS requirements for all 6 substances, including the requirement that lead not exceed 0.1% by weight in homogeneous materials. Where designed to be soldered at high temperatures, TI Pb-Free products are suitable for use in specified lead-free processes.

**Pb-Free (RoHS Exempt):** This component has a RoHS exemption for either 1) lead-based flip-chip solder bumps used between the die and package, or 2) lead-based die adhesive used between the die and leadframe. The component is otherwise considered Pb-Free (RoHS compatible) as defined above.

**Green (RoHS & no Sb/Br):** TI defines "Green" to mean Pb-Free (RoHS compatible), and free of Bromine (Br) and Antimony (Sb) based flame retardants (Br or Sb do not exceed 0.1% by weight in homogeneous material)

<sup>(3)</sup> MSL, Peak Temp. -- The Moisture Sensitivity Level rating according to the JEDEC industry standard classifications, and peak solder temperature.

**Important Information and Disclaimer:** The information provided on this page represents TI's knowledge and belief as of the date that it is provided. TI bases its knowledge and belief on information provided by third parties, and makes no representation or warranty as to the accuracy of such information. Efforts are underway to better integrate information from third parties. TI has taken and continues to take reasonable steps to provide representative and accurate information but may not have conducted destructive testing or chemical analysis on incoming materials and chemicals. TI and TI suppliers consider certain information to be proprietary, and thus CAS numbers and other limited information may not be available for release.

In no event shall TI's liability arising out of such information exceed the total purchase price of the TI part(s) at issue in this document sold by TI to Customer on an annual basis.

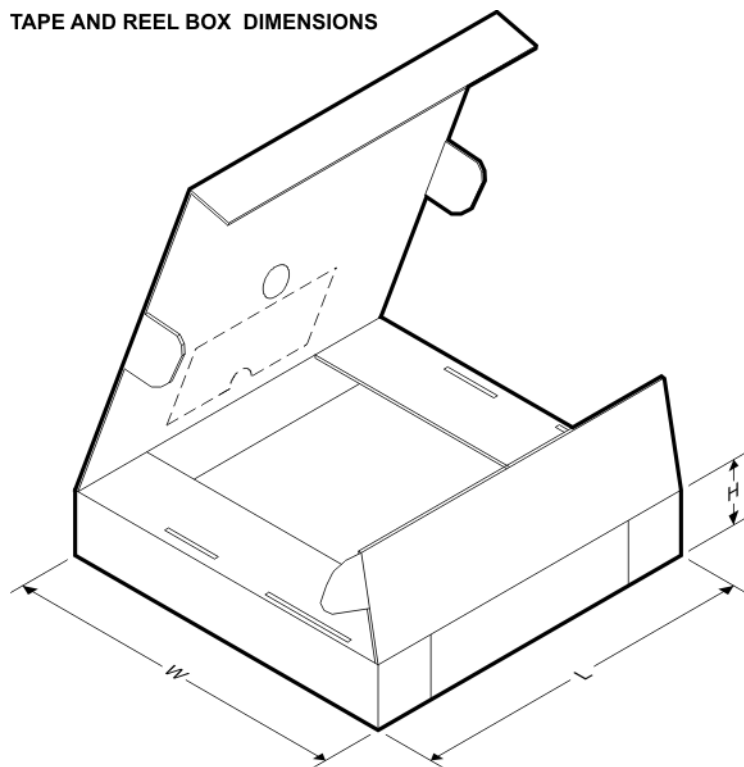
**TAPE AND REEL INFORMATION**



\*All dimensions are nominal

| Device         | Package Type | Package Drawing | Pins | SPQ  | Reel Diameter (mm) | Reel Width W1 (mm) | A0 (mm) | B0 (mm) | K0 (mm) | P1 (mm) | W (mm) | Pin1 Quadrant |
|----------------|--------------|-----------------|------|------|--------------------|--------------------|---------|---------|---------|---------|--------|---------------|
| SN75ALS1177NSR | SO           | NS              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |
| SN75ALS1178NSR | SO           | NS              | 16   | 2000 | 330.0              | 16.4               | 8.2     | 10.5    | 2.5     | 12.0    | 16.0   | Q1            |

## TAPE AND REEL BOX DIMENSIONS



\*All dimensions are nominal

| Device         | Package Type | Package Drawing | Pins | SPQ  | Length (mm) | Width (mm) | Height (mm) |
|----------------|--------------|-----------------|------|------|-------------|------------|-------------|
| SN75ALS1177NSR | SO           | NS              | 16   | 2000 | 346.0       | 346.0      | 33.0        |
| SN75ALS1178NSR | SO           | NS              | 16   | 2000 | 346.0       | 346.0      | 33.0        |

# MECHANICAL DATA

NS (R-PDSO-G\*\*)

PLASTIC SMALL-OUTLINE PACKAGE

14-PINS SHOWN



| DIM \ PINS ** | 14    | 16    | 20    | 24    |
|---------------|-------|-------|-------|-------|
| A MAX         | 10,50 | 10,50 | 12,90 | 15,30 |
| A MIN         | 9,90  | 9,90  | 12,30 | 14,70 |

4040062/C 03/03

- NOTES:
- A. All linear dimensions are in millimeters.
  - B. This drawing is subject to change without notice.
  - C. Body dimensions do not include mold flash or protrusion, not to exceed 0,15.

N (R-PDIP-T\*\*)

16 PINS SHOWN

## PLASTIC DUAL-IN-LINE PACKAGE



| PINS **<br>DIM      | 14               | 16               | 18               | 20               |
|---------------------|------------------|------------------|------------------|------------------|
| A MAX               | 0.775<br>(19,69) | 0.775<br>(19,69) | 0.920<br>(23,37) | 1.060<br>(26,92) |
| A MIN               | 0.745<br>(18,92) | 0.745<br>(18,92) | 0.850<br>(21,59) | 0.940<br>(23,88) |
| MS-001<br>VARIATION | AA               | BB               | AC               | AD               |



4040049/E 12/2002

NOTES:

- A. All linear dimensions are in inches (millimeters).  
B. This drawing is subject to change without notice.
-  Falls within JEDEC MS-001, except 18 and 20 pin minimum body length (Dim A).  
 The 20 pin end lead shoulder width is a vendor option, either half or full width.

## IMPORTANT NOTICE

Texas Instruments Incorporated and its subsidiaries (TI) reserve the right to make corrections, modifications, enhancements, improvements, and other changes to its products and services at any time and to discontinue any product or service without notice. Customers should obtain the latest relevant information before placing orders and should verify that such information is current and complete. All products are sold subject to TI's terms and conditions of sale supplied at the time of order acknowledgment.

TI warrants performance of its hardware products to the specifications applicable at the time of sale in accordance with TI's standard warranty. Testing and other quality control techniques are used to the extent TI deems necessary to support this warranty. Except where mandated by government requirements, testing of all parameters of each product is not necessarily performed.

TI assumes no liability for applications assistance or customer product design. Customers are responsible for their products and applications using TI components. To minimize the risks associated with customer products and applications, customers should provide adequate design and operating safeguards.

TI does not warrant or represent that any license, either express or implied, is granted under any TI patent right, copyright, mask work right, or other TI intellectual property right relating to any combination, machine, or process in which TI products or services are used. Information published by TI regarding third-party products or services does not constitute a license from TI to use such products or services or a warranty or endorsement thereof. Use of such information may require a license from a third party under the patents or other intellectual property of the third party, or a license from TI under the patents or other intellectual property of TI.

Reproduction of TI information in TI data books or data sheets is permissible only if reproduction is without alteration and is accompanied by all associated warranties, conditions, limitations, and notices. Reproduction of this information with alteration is an unfair and deceptive business practice. TI is not responsible or liable for such altered documentation. Information of third parties may be subject to additional restrictions.

Resale of TI products or services with statements different from or beyond the parameters stated by TI for that product or service voids all express and any implied warranties for the associated TI product or service and is an unfair and deceptive business practice. TI is not responsible or liable for any such statements.

TI products are not authorized for use in safety-critical applications (such as life support) where a failure of the TI product would reasonably be expected to cause severe personal injury or death, unless officers of the parties have executed an agreement specifically governing such use. Buyers represent that they have all necessary expertise in the safety and regulatory ramifications of their applications, and acknowledge and agree that they are solely responsible for all legal, regulatory and safety-related requirements concerning their products and any use of TI products in such safety-critical applications, notwithstanding any applications-related information or support that may be provided by TI. Further, Buyers must fully indemnify TI and its representatives against any damages arising out of the use of TI products in such safety-critical applications.

TI products are neither designed nor intended for use in military/aerospace applications or environments unless the TI products are specifically designated by TI as military-grade or "enhanced plastic." Only products designated by TI as military-grade meet military specifications. Buyers acknowledge and agree that any such use of TI products which TI has not designated as military-grade is solely at the Buyer's risk, and that they are solely responsible for compliance with all legal and regulatory requirements in connection with such use.

TI products are neither designed nor intended for use in automotive applications or environments unless the specific TI products are designated by TI as compliant with ISO/TS 16949 requirements. Buyers acknowledge and agree that, if they use any non-designated products in automotive applications, TI will not be responsible for any failure to meet such requirements.

Following are URLs where you can obtain information on other Texas Instruments products and application solutions:

### Products

|                             |                                                                    |
|-----------------------------|--------------------------------------------------------------------|
| Amplifiers                  | <a href="http://amplifier.ti.com">amplifier.ti.com</a>             |
| Data Converters             | <a href="http://dataconverter.ti.com">dataconverter.ti.com</a>     |
| DSP                         | <a href="http://dsp.ti.com">dsp.ti.com</a>                         |
| Clocks and Timers           | <a href="http://www.ti.com/clocks">www.ti.com/clocks</a>           |
| Interface                   | <a href="http://interface.ti.com">interface.ti.com</a>             |
| Logic                       | <a href="http://logic.ti.com">logic.ti.com</a>                     |
| Power Mgmt                  | <a href="http://power.ti.com">power.ti.com</a>                     |
| Microcontrollers            | <a href="http://microcontroller.ti.com">microcontroller.ti.com</a> |
| RFID                        | <a href="http://www.ti-rfid.com">www.ti-rfid.com</a>               |
| RF/IF and ZigBee® Solutions | <a href="http://www.ti.com/lprf">www.ti.com/lprf</a>               |

### Applications

|                    |                                                                          |
|--------------------|--------------------------------------------------------------------------|
| Audio              | <a href="http://www.ti.com/audio">www.ti.com/audio</a>                   |
| Automotive         | <a href="http://www.ti.com/automotive">www.ti.com/automotive</a>         |
| Broadband          | <a href="http://www.ti.com/broadband">www.ti.com/broadband</a>           |
| Digital Control    | <a href="http://www.ti.com/digitalcontrol">www.ti.com/digitalcontrol</a> |
| Medical            | <a href="http://www.ti.com/medical">www.ti.com/medical</a>               |
| Military           | <a href="http://www.ti.com/military">www.ti.com/military</a>             |
| Optical Networking | <a href="http://www.ti.com/opticalnetwork">www.ti.com/opticalnetwork</a> |
| Security           | <a href="http://www.ti.com/security">www.ti.com/security</a>             |
| Telephony          | <a href="http://www.ti.com/telephony">www.ti.com/telephony</a>           |
| Video & Imaging    | <a href="http://www.ti.com/video">www.ti.com/video</a>                   |
| Wireless           | <a href="http://www.ti.com/wireless">www.ti.com/wireless</a>             |

Mailing Address: Texas Instruments, Post Office Box 655303, Dallas, Texas 75265  
Copyright © 2008, Texas Instruments Incorporated